SUBSIDENCE

Subsidence, the sinking of the land surface, began in 1940's with ground water pumping at Terminal Island Naval Shipyard. The area sank more than four feet by 1945, far more than attributed to groundwater withdrawal. In 1951, the rate of subsidence exceeded two feet per year. By 1958, the affected area was twenty square miles and extended beyond the Harbor District. Total subsidence reached 29 feet in the center of the "subsidence bowl." The ocean inundated wharves, rail lines and pipelines were warped or sheared, while some buildings and streets were cracked and displaced. Ninety-five oil wells were severely damaged or sheared-off by underground slippage and movement. Oil, gas and water production caused pressure losses and the weight of the overburden compacted the oil sands. The surface sank in response to this underground compaction.

In the 1950's, the DOP showed that water injection (water flooding) would repressure the oil formations, stop the underground compaction and surface subsidence, and increase oil recovery. In order to conduct effective coordinated water flood operations, the various fault blocks needed to be "unitized." In 1958, the State passed legislation enabling the City and numerous private owners to create 4 Fault Block Units. Each Fault Block Unit was operated by one owner and the revenues and expenses were shared in proportion to each participant's ownership percentage. By 1966, subsidence had stabilized and, in some areas, later rebounded (rose) by up to 2 feet. Damage and remediation costs reached an estimated $100 million. A lesson learned, the citizens of Long Beach required that the eastern, offshore extension of the field be unitized prior to development and water injection be started immediately.